CONCRETE-STEEL ARCH BRIDGES

RANSOME SYSTEM

JANUARY 1902

Aberthaw Construction Co. (Inc.)

7 EXCHANGE PLACE, BOSTON

CONCRETE ENGINEERS and CONTRACTORS for CONCRETE MASONRY of all kinds

TELEPHONE CONNECTION MEMBER MASTER BUILDERS' ASSOCIATION CIRCULAR NO. 5

THE dissatisfaction felt towards steel bridges has created a demand for a more durable type of construction. This dissatisfaction has been noticeable particularly in railroad work, where stone bridges are beginning to be widely used even at a great advance on the cost of steel structures. The Association of Railway Superintendents of Bridges and Buildings issued a report (for abstract see *Engineering News*, Oct. 18, 1900, page 271) stating that the majority of large railroads, representing 85,000 miles of track, made a very general use of concrete in structural work, preferring it to stone work.

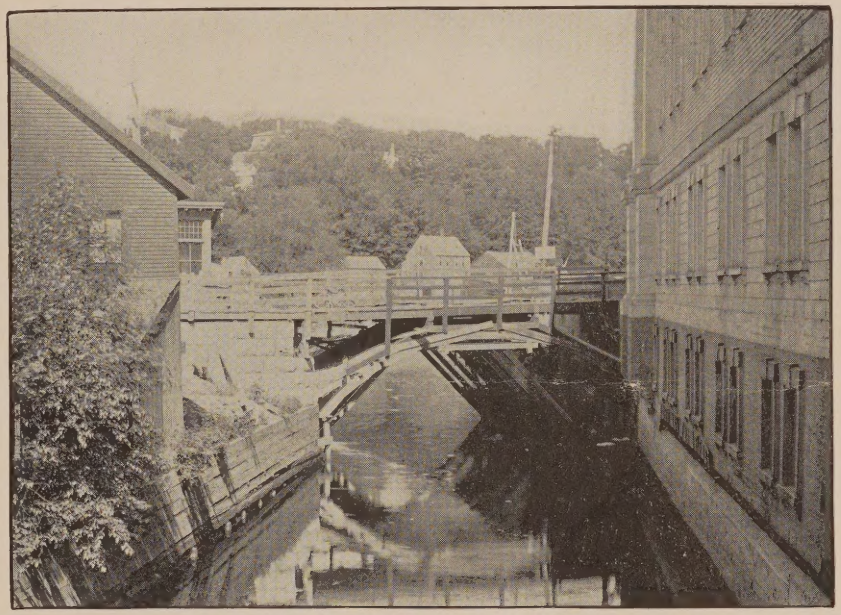
A general interest is now being shown by railway, municipal and consulting engineers, also by county, city, town officials and many others, in concrete and concrete-steel arch bridges.

Concrete-steel bridges can be built at a slight advance on the cost of steel structures. When the cost of maintenance is considered, the former type is really the cheaper.

We illustrate on the pages following some of the work of the past season. Each bridge is different in design from the other. We are solely responsible for the design of those at Bangor and Plymouth. The construction is rapid and the appearance is pleasing. We have increased our facilities for executing this class of work and solicit a continuance of the confidence we have received in the past.

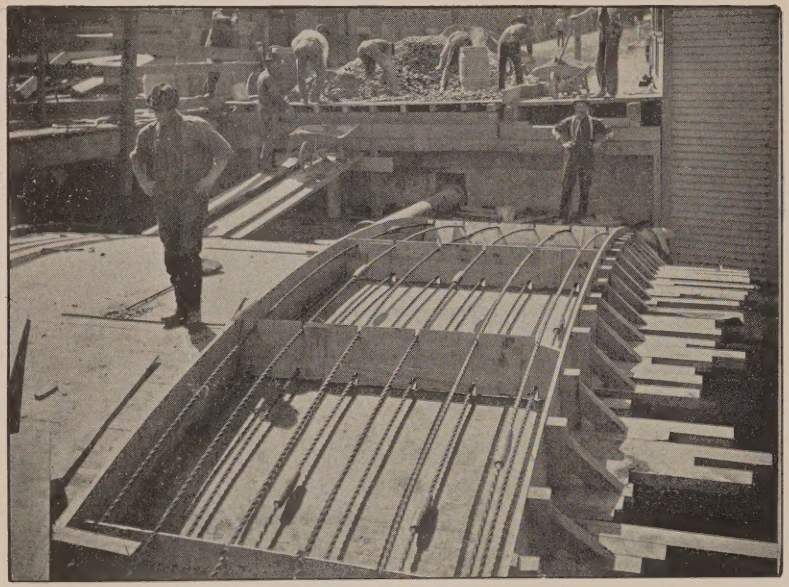
Centers built under old bridge which was only closed to travel sixteen days.

The centers were designed so as to keep stream open to navigation.



BANGOR—SHOWING CENTERING.

This and the three following views are of the Franklin Street Bridge over Kenduskeag Stream, Bangor, Me.



BANGOR—VIEW SHOWING STEEL IN PLACE.

A 6-foot ring cast each day. Concrete was placed continuously from each skewback until the arch was closed at center.

Several bars were partly imbedded crosswise in one day's work, and projected into the next section. This makes the arch a monolithic unit.

BANGOR, ME. Three-quarter-inch square cold twisted steel bars were set in pairs 2 inches from intrados and extrados of arch, 14 inches on centers. These run continuously from one skewback to the other. They are not fastened at the ends. They resist all tensile stresses from any method of loading, and prevent rupture of the concrete, which resists the compressive stresses.

TEST.

There was no measurable deflection of centers when arch was cast, or of arch when center was drawn, and of large arch loaded with 50 tons. There was no vibration with moving loads.

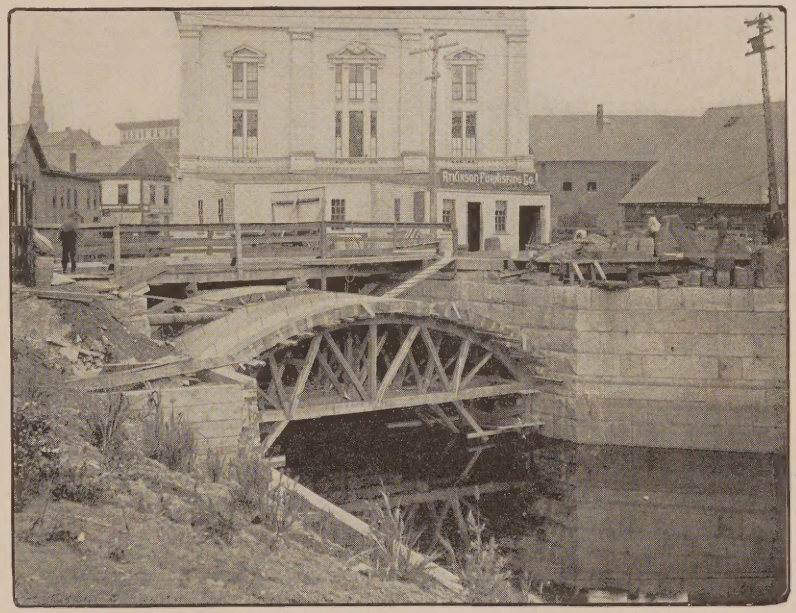
Extrados water-proofed and sloped to drain.

Mixture of arch. Lehigh Portland cement, sand and gravel screenings:

1 : 2 : 4

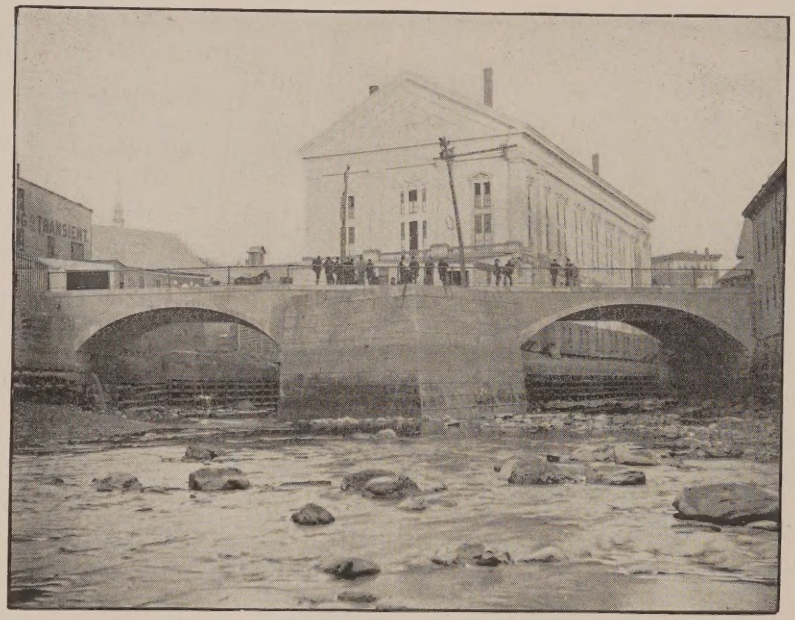
Walls and sidewalk:

1 : 3 : 6



BANGOR—LEFT ARCH PARTLY CAST.

The existing granite abutments, 26 feet high, were not reinforced. Skewbacks were cut 12 feet from the top. A 10-inch gas main cut through arch in two places. Twisted bars were imbedded in arch and projected upward to tie together the arch and 8-inch face wall and the 6-inch retaining wall with buttresses under the curb. The sidewalks are supported, over areas, by the walls. The roadway is filled with earth and paved with granite blocks on a concrete base. The joints were grouted with cement.



VIEW OF FINISHED BRIDGE.

DIMENSIONS.

SMALL ARCH.

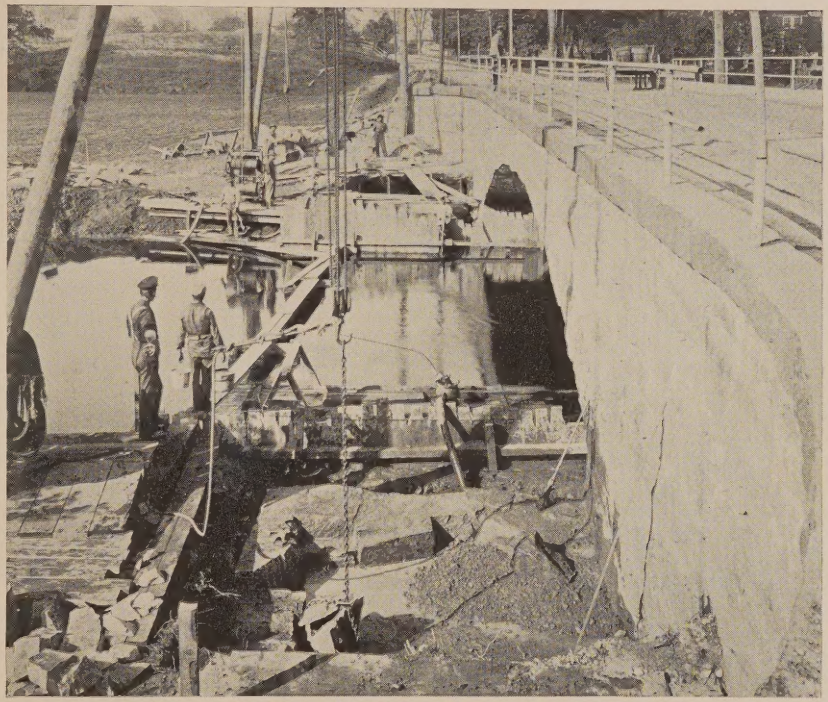
Span,	38	feet	2	inches
Rise,	7	"	6	"
Key,	—		10	"
Width,	40	"	0	"

LARGE ARCH.

Span,	46	feet	$7\frac{3}{4}$	inches
Rise,	8	"	7	"
Key,	—	"	11	"
Springer,	—	"	30	"

COST, $5,815.

The soffit, face of arch, coping, and sidewalks have granolithic finish. The walls are picked face. All are the natural color of cement.

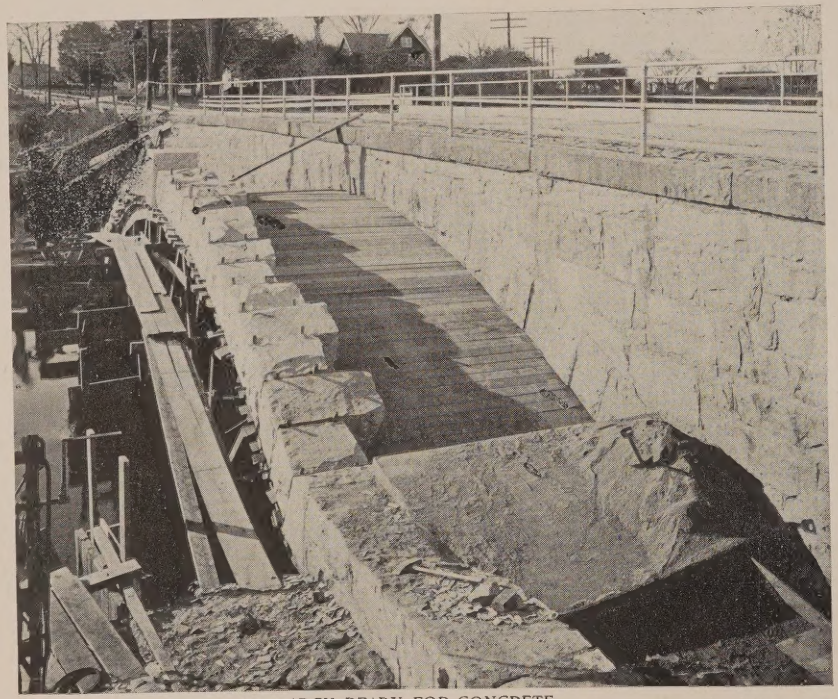


LEONARD METCALF,
Engineer.

Built for
Concord & Clinton St.
Railway Company.

CONCORD JUNCTION — FOUNDATION PLAN.

This 12-foot addition was built on the side of a narrow granite arch bridge across the Assabet River on Main Street, at Concord Junction, Mass. This view shows cofferdams and concrete abutments, with granite facing under way.



Span	56 feet
Rise	7 "
Keystone	16 inches
Springer	33 "

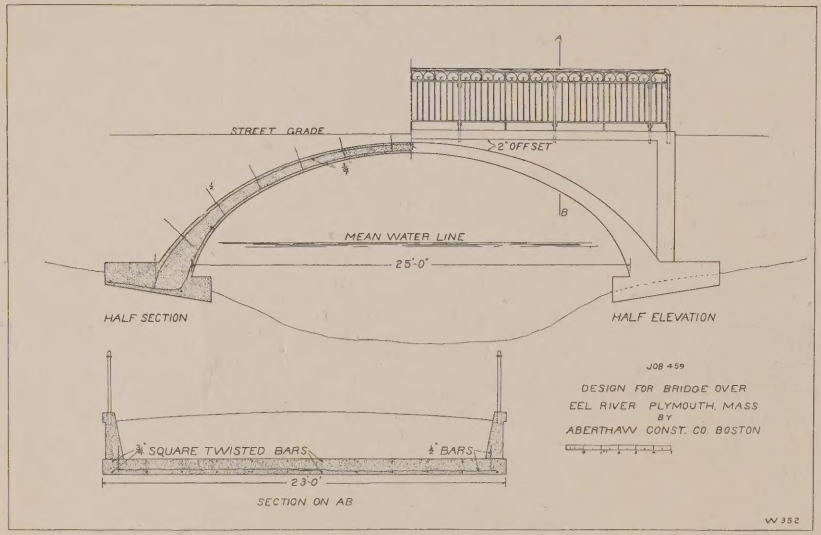
ARCH READY FOR CONCRETE.

CONCORD JUNCTION. View showing abutments completed. Face ring course set, and center ready for plain concrete arch. Spandril and wing walls were taken down and rebuilt on new face. The haunches were filled with earth.

There was no settlement when center was removed and arch loaded.

FINISHED STRUCTURE.

CONCORD JUNCTION, MASS. Finished structure. The arch was built expressly to carry electric cars. This is the hardest service to which a highway bridge is subjected.



HALF LONGITUDINAL SECTION AND HALF ELEVATION OF EEL RIVER BRIDGE.

The spread foundation, reinforced with twisted steel, is as strong as the usual plain, massive construction.

Soil: Fine, medium, compact sand, about 15 feet deep.

Bridge over Eel River on Old Sandwich Road in Plymouth, Mass. This bridge receives only light country highway service.

VIEW OF CENTERS. PLYMOUTH, MASS.

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